

## EPIDEMIOLOGICAL PRIORITIES AS A BASIS FOR HEALTH POLICY

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CAN epidemiological priorities in fact be used as a basis for health policy? Before we can answer the question, we shall need to agree on some definitions.

### THE EPIDEMIOLOGICAL PERSPECTIVE

The root meaning of epidemiology, of course, is “that which is upon the people.” Essential to the epidemiological perspective is knowledge both of the numerator (number of cases, deaths, physician visits, and so forth) and the denominator (the population at risk). I shall confine my attention first to the epidemiological view of health and illness as distinguished from the epidemiological analysis of health services. We can recognize four different and distinct points of view held by major health-policy decision makers, namely, the average citizen, the physician, the health-care manager, and the public health expert.

*The average citizen's perspective.* According to certain data, most Americans are well most of the time. The National Health Survey, for example, tells us that 86% of people in this country have no activity limitation and that the odds are 4:1 against having an acute illness in the course of a year.<sup>1</sup> On the other hand, there is a large gray area expressed in the well-known diagram produced by White and others in 1961 (Figure 1).<sup>2</sup> During the course of a month, 750 of 1,000 adults experience some symptom or injury, but only 250 go to a physician. Thus, a large majority

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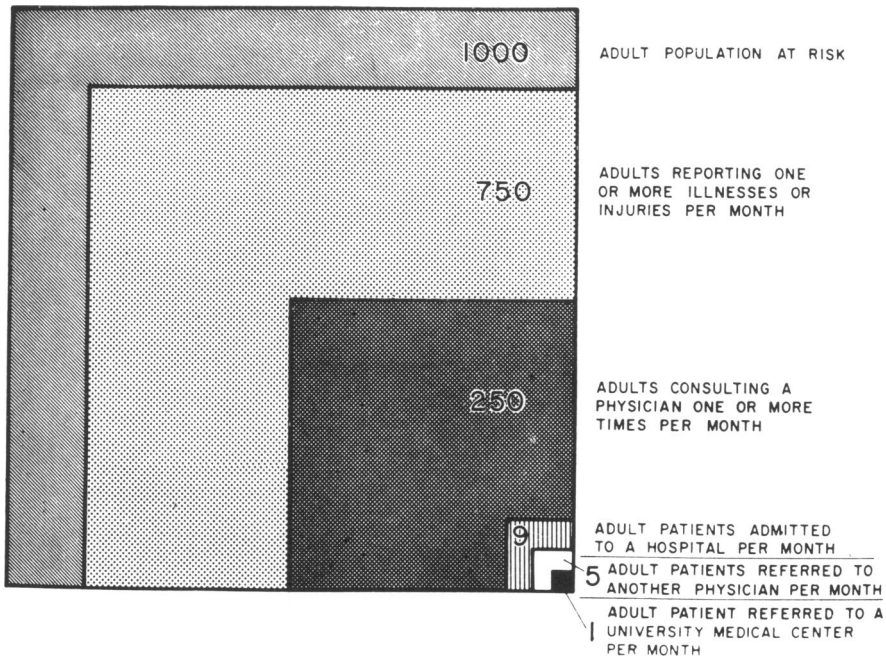


Fig. 1. Monthly prevalence of illness and use of medical care, United States; estimates for adults 16 years of age and over, 1961.<sup>2</sup> Reproduced by permission from White, K. L., Williams, T. F., and Greenberg, B. G.: The ecology of medical care. *N. Engl. J. Med.* 265:855-92, 1961.

of symptoms are either set aside as minor or remain as unresolved worries. As Belloc and Breslow have shown, only 30% of the population are completely free of symptoms at any given time.<sup>3</sup> The common man, therefore, is aware of his vulnerability as a member of the human race. He knows he is part of the denominator, but he is not sure what is in the numerator. As for health policy, he would like some protection against illness and death—sometimes against the health-care system as well—and he would prefer to have this protection immediately and furnished in a free, painless, and undemanding manner.

*The physician's perspective*, in contrast, tends to be specific but narrow. His whole population is sick or malingering (now politely called “the worried well”). He knows quite a bit about the numerator but very little about the denominator, and his attention is concentrated on institutions and technology. A second diagram produced by White in 1973 makes an interesting contrast with the previous one (Figure 2), and represents 1,000

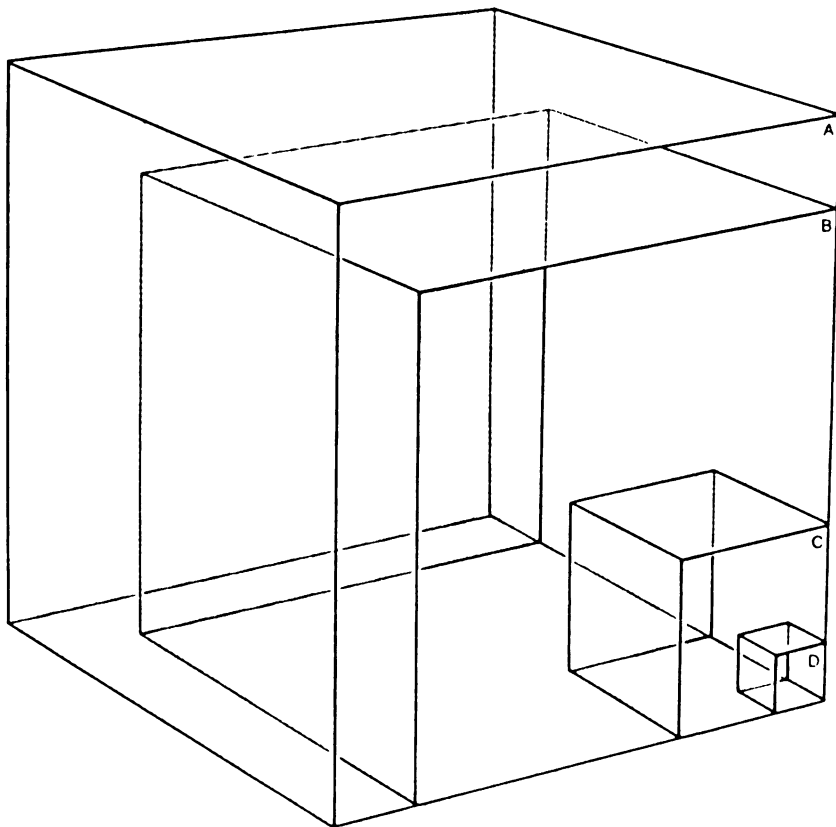


Fig. 2. Annual demand for medical care: A) total United States population (1,000), 1970; B) persons visiting a physician in an ambulatory setting at least once (720); C) persons admitted to a hospital at least once (100); D) persons admitted to a university hospital at least once (10).<sup>4</sup> Reproduced by permission from White, K. L.: Life and death and medicine. *Sci. Am.* 229: 22-23, 1973.

people at risk during a year, as contrasted with a month in the previous diagram. Now we find that of 1,000 people at risk, 720 visit a physician, 100 are admitted to a hospital, and 10 to a university hospital. Given enough time, as the physician sees it, most people will come to him. Thus, he is, for the most part, unaware of the fleeting hints of disease which bedevil patients outside the office. The physician finds his work concentrated on the diagnosis and treatment of symptoms (two thirds of his office visits) with quite a bit of additional routine work, some of which he may not really consider to be "doctor's work." Increasingly, his preference is

to concentrate on sick people in the hospital. The physician, thus, is largely unaware of the population and marginally concerned with prevention as a part of health policy, but—and this is important—he is a facultative scientist as well.

*The health-care manager's perspective.* Increasingly numerous and powerful, administrators of hospitals, clinics, group practices, and other health services are decision-makers in the ascendant. Along with government officials and executives of medical insurance companies and firms that manufacture drugs and health-care equipment, these technocrats of the health-care industry are more keenly aware of the general population than is the physician. The denominator the manager sees, however, is essentially one-dimensional. For him economics dominates, and the policies he favors are expressed in terms of financial costs and financial benefits, while unmet needs, functional results, health maintenance, and the prevention of illness are all difficult to put a price on and are therefore seldom included in the equation.

*The public health expert's perspective* is that of a hybrid: a student of population medicine, something of a social engineer, and often medically trained as well (which may set up a cognitive dissonance). It is his business to be informed about both numerator and denominator. When asked to formulate policy, he looks at the epidemiological problem and points to the obvious conclusion that prevention is the best investment.<sup>5</sup> Unfortunately, however, several major obstacles exist to implementing a purely epidemiological and preventive program. I shall return to these later, but for the present I wish to point out that, for these and other reasons, public health experts and planners tend to produce plans, recommendations, studies, and reports that are, too often, unrelated to financing or to the work of health providers and that therefore produce little or no result. Today's public health expert, despite his concern for the population and for prevention, is regrettably ineffectual.

### PREVENTIVE ACTION

Can we bring these divergent viewpoints together in a practicable public policy? As an approach to answering that question I would like to examine briefly how the epidemiological perspective can lead to preventive action.

First, let me acknowledge current skepticism as to whether medical practice has ever, in fact, incorporated sound preventive practice. I would

maintain, on the contrary, that contemporary medical practice rests on firm and extensive epidemiological foundations. This is not more widely acknowledged because incorporation of preventive practice into medicine has come about gradually, over many years. Like many other features of our modern world, we tend to accept our hygienic and health habits as the norm without noticing how greatly things have changed.

Physicians practice *primary* prevention in such humble forms as teaching personal hygiene, immunizing infants and children, prescribing contraceptives, and treating streptococcal infections. Still more commonly, they practice *secondary* prevention of the recurrence or progression of disease in such ordinary matters as the insulin treatment of diabetes, giving vitamin B<sub>12</sub> for pernicious anemia, surgery for acute appendicitis, and many other forms of early treatment. Even more of medical practice is taken up with *tertiary* prevention of the complications and symptoms of disease as, for example, the treatment of heart failure with digitalis, the prescription of medicine for pain, corrective surgery, and the like.

A second fundamental point—one to which I wish to return—is that the public sanitation we take for granted was achieved only after a long and difficult battle, largely initiated by 19th century physicians and scientists.

#### APPLYING WHAT WE KNOW

The next question is whether we regularly apply preventive measures we know to be effective. If we glance at the record or listen to Joseph A. Califano, Jr., Secretary of the Department of Health, Education, and Welfare, it is clear that we do this, but not as consistently as we should. For example, consider the infant mortality curve in the United States since 1900 (Figure 3). An unprecedented decline of approximately two thirds took place between 1920 and 1950, unmistakably related to more and better prenatal care and to moving the delivery from the home into the hospital. Between 1955 and 1965 this decline slowed down and virtually stopped,<sup>6</sup> causing much public concern that the United States was falling behind other developing countries, and generating a new awareness that segments of our population, in the inner cities and rural areas particularly, had much higher than average infant-mortality rates. In 1964 the Maternal and Infant Care amendments to the Social Security program were passed, with the stated purpose “to help reduce infant and maternal mortality.” The decline in infant mortality has since been resumed impressively. Other



Fig. 3. Infant mortality rate, United States, 1915-1976, showing date (1964) of Maternal and Infant Care Amendments.<sup>6</sup>

factors are contributory, but the important point for a conference on policy is that there has evidently been a direct response in epidemiological terms to legislation which applied a rational preventive policy at the national level.

#### HOW CAN WE INCREASE OUR CAPACITY FOR PREVENTION?

But the benefits we can expect from simply applying what we know are limited. A more important question for the formulation of a forward-looking public policy is: how can we increase our capacity to prevent disease and death? I would like to review efforts to prevent two major diseases: smallpox, an "old" disease, and cancer of the lung, a "new" disease. We are at quite different stages in the control of these two diseases, but each shows a common pattern in which the major policy decision-makers, namely, the people, the physicians, and the public health experts, all play necessary parts in gathering knowledge from its early roots in folk wisdom and common sense observation, transforming them into scientific understanding, and applying them as effective prevention. A sequence can be defined with three phases, which I shall call the popular, scientific, and application phases.

## SMALLPOX—"AN OLD" DISEASE

The *popular phase* of smallpox control began hundreds of years ago in the folk medicine of China and Turkey.<sup>7</sup> The first convincing description of the disease comes from Baghdad in 923 A.D. Travelers from western Europe to the Middle East in the 18th century discovered the ancient practice of inoculation, which was simply the transmission of a mild case of the disease by applying the crusts of smallpox lesions to the scarified skin of a healthy individual. Scientifically untrained but perceptive travelers such as Lady Mary Wortley Montagu brought the procedure back to England, where it was initially resisted by physicians, she thought, for pecuniary reasons. By 1722, however, it became evident that inoculation did indeed produce immunity to the disease, and members of the royal court took it up, which encouraged Dr. Charles Maitland to conduct a successful experiment on condemned prisoners, thus initiating the *scientific phase*. At the same time, in Boston, Dr. Zabdiel Boylston first introduced inoculation in 1721 at the urging of Cotton Mather, another perceptive layman.

The *application phase* began with the widening acceptance of inoculation. It is likely, for example, that Canada was saved for the Crown because the British soldiers at Quebec had been inoculated, whereas the Americans had not and therefore lost the siege of Quebec in 1775-1776, when an epidemic of smallpox occurred.

The major event in the control of smallpox, of course, was the discovery of vaccination in 1796 by Jenner. The story of how his discovery was tested and then applied to control the disease is now coming to a dramatic conclusion with the expected worldwide eradication of the disease.

Many more historical examples could be cited. The point I want to make is that the people—and a few alert physicians—have been able to make impressive progress toward the understanding and early control of disease, often long before a specific etiology was known or thoroughly scientific prevention established. We tend to think of the control of infectious disease as the fortunate result of the discovery and application of the germ theory. But let us bear in mind Wade Hampton Frost's description of the state of knowledge in the middle of the 19th century:

...a good deal was known, at least in an empirical way, of the epidemiology of the endemic diseases; as, for instance, of their varying mortality in different years and in different places; of the communicability from person to person of the venereal diseases, smallpox, measles, and some of the other exanthemata, of the definite immunity conferred by some diseases; of the association of typhoid and typhus fever with filth and of malaria with certain localities...<sup>8</sup>

Courageous and clear-sighted physicians and scientists saw the potential for disease control in these associations and were among the first to take action. In New York City the control of typhoid carriers was established in 1907, the chlorination of water in 1910, and the pasteurization of milk in 1912. The triumphant results of such scientific applications are now common knowledge.

### CANCER OF THE LUNG—A “NEW” DISEASE

Where do we stand with regard to prevention of cancer of the lung? Here, as with smallpox, we can identify the three sequential phases. The *popular phase* goes back at least to 1604, when James I wrote a vitriolic attack on the evils of smoking. Popular suspicion of tobacco, waxing and waning since, is today rapidly on the rise.

Another clue to the cause of lung cancer came from miners in the mountains of Saxony and Bohemia. For more than 500 years these men knew that they were likely to die of a lung disease called *Bergkrankheit*. In 1879 Harting and Hesse recognized this disease as cancer of the lung, and in 1921, following a suggestion made by a layman, Margarete Uhlig, proposed that this cancer might be caused by radiation, since it was from the ore of these mines that the Curies first isolated radium.<sup>9</sup>

A third lead was the common observation that the dramatic increase in deaths from cancer of the lung has paralleled what Richard Doll called “a general atmospheric pollution from the exhaust fumes of cars, from the surface dust of tarred roads and from gas-works, industrial plants, and coal fires.”<sup>10</sup>

*The scientific phase* began with Doll and Hill’s 1950 report, “Smoking and Carcinoma Of the Lung.”<sup>10</sup> From this point on, the working out of the puzzle, culminating in the experimental production of pulmonary malignancy in dogs by exposure to cigarette smoke (1970) is familiar to all of us. The other clues passed on to us from popular awareness, namely, that air pollution and radiation also contribute to the genesis of this disease, are under active investigation, and we surely need to establish a more solid scientific proof of the multiple causes of this disease.

Meanwhile, do we not already see the beginning of the *application phase*? Are we not at a threshold in the control of lung cancer comparable to the one physicians and scientists of the mid-19th century crossed when they began to campaign for sanitation, quarantine, and immunization to control infectious disease? Do we not know enough now to put the force of



our academic and professional prestige behind efforts to stop the sale of tobacco or to minimize its use by heavy taxation? Do we not now have the knowledge and self-confidence to speak up to industrialists and public officials and demand implementation of air-pollution control? Do we not have enough information to take a strong scientific and medical stand against the proliferation of nuclear power plants and their wastes?

#### EPIDEMIOLOGICAL PRIORITIES CAN BE USED AS A BASIS FOR HEALTH POLICY

Let me return to the question: Can epidemiological priorities be used as a basis for health policy? The answer is unmistakably *yes*. For all causes of human illness, including the so-called “chronic degenerative diseases,” “immunological” diseases, and diseases of behavior and adaptation, we—and here I include the people, physician-scientists, managers and public health experts—stand somewhere along the sequence of popular knowledge, scientific understanding, and application. For many of these conditions we remain in the Dark Ages, but for many we are entering the exciting phase of scientific discovery and may even be ready, if we have the courage to acknowledge it, to begin active prevention now.

#### SUPERABLE OBSTACLES

But, some will object, these are different times, the problems of chronic disease are complex and intractable, and obstacles to their control are numerous and powerful. Such obstacles do indeed exist, but are they more insuperable than those our predecessors faced 100 years ago when they undertook to control infectious disease? Let us examine some of the obstacles more closely.

First is the obstacle of therapeutic nihilism. Thomas McKeown states this thesis in his new monograph, *The Role of Medicine*: “...the determinants of health are largely outside the medical care system.”<sup>11</sup> Franz Ingelfinger has gently taken him to task in an editorial, but even he still seems to miss the point of how such an attitude can foster passivity on the part of the physician.<sup>12</sup> For physicians to accept the nihilistic view that medicine is unrelated to the control of disease is to go a long way toward inactivating one of the most potent agents we have.

Closely related to this obstructive attitude is the problem of the practicing physician’s perspective. As Walter McNerney puts it bluntly, “most medical practitioners and health administrators fail to think in epidemiolog-

ical terms.’’<sup>13</sup> This is a matter of information and understanding, distinguishable from the nihilistic attitudes I have just referred to. Clearly, physicians have repeatedly shown themselves capable not only of failing to recognize new scientific truths, but even of vigorously and selfishly opposing them.

It is remarkable, on the other hand, that certain British general practitioners have made important contributions to understanding the epidemiology of disease, whereas this has not happened, to my knowledge, in the United States. I suggest that this is not because the British general practitioner is a better epidemiologist by instinct or even by training, but that he is encouraged to think in epidemiological terms because he has a defined population to serve—he knows his denominator. To my mind, this argues strongly for planning population-based elements in our own future health-care system.

Another major obstacle often cited as a reason for inaction is the inertia of the total health-care system, with its massive costs and its preoccupation with technology and institutions—a dinosaur that seems to have followed us home and now threatens to eat us out of house and home. I suggest that even though we may not be able to tame this creature all at once, perhaps we can train it to do some useful work, by providing us with better health data, establishing record linkage and, above all, planning, budgeting, and allocating substantial funds for epidemiological research and public health education.

Another big obstacle to the prevention of disease is often said to be ignorance, that we are not sure enough of the facts to justify major efforts for disease control. With due respect to scientific skepticism, which is always in order, I hope that I have already convinced you that reasonable action based on the evident facts of disease distribution can produce favorable results long before the cause is known exactly. Further—and this should be an important policy item—we have a powerful new tool in the randomized controlled trial which can reduce our ignorance much more rapidly than the more empirical experiments of the past. For example, controlled trials during the last 10 years have put the treatment (and secondary prevention) of hypertension on a sound basis, and we are now better equipped than ever before to carry through after a screening program.

A common line of thinking about the prevention of the chronic, so-called degenerative diseases holds that most risk factors we know about

can be reduced only by altering human behavior, and that this is either outside the scope of medicine or impossible. Again, I think we underrate ourselves. Physicians have been very successful in the past in indoctrinating people—not only with good habits, such as washing, bathing, refrigerating food, using pasteurized milk, and vaccinating preschool children—but also, we must confess, in establishing some bad habits, such as sleeping in tightly closed rooms and going to excessive lengths to achieve a daily bowel movement. Even the very habits which seem difficult to alter today are changing. Corpulence was common among prestigious persons, including physicians, of Victorian times. The fact that obesity is now out of fashion was not, of course, entirely brought about by physicians, but it seems likely that such medical advances as the dietary treatment of diabetes, hypertension, and coronary disease (both thought to be hazards of the upper classes), and the discovery of vitamins, all contributed to the change. I believe that a comparable and as yet undocumented revolution is taking place in exercise habits, this time more clearly led by physicians such as Paul Dudley White. Human behavior can change, and doctors can guide this change in the direction of better health.

Finally, it is objected that overwhelming forces are ranged against any effort to prevent major diseases by such public action as regulating tobacco or setting air-pollution standards. Of course, the tobacco industry resists efforts to control smoking, but so did the dairy industry try to prevent the pasteurization of milk. Sewer construction in Baltimore lagged until William Osler challenged the mayor and the taxpayers in a public meeting. It took some years of persistent effort by Dr. Stephen Smith and other citizens to get the New York Assembly to establish a Board of Health, but Smith had the facts, which he had gathered in a classic sanitary survey of New York City in 1865. He did not know the cause of typhus, but he knew that it bred in filthy and crowded conditions, and, as a physician, he took action.

#### EPIDEMIOLOGICAL POLICIES

To what actions do present epidemiological priorities point? And what policies can we adopt to stimulate such actions? I recommend three policy objectives:

Objective 1: *Widen the epidemiological perspective of the physician.* Our own initiative as physicians and medical educators is essential to remedy the glaring deficiency of public health education in medical

schools, in postgraduate and continuing medical education, and in the education of the public. Physicians are essential agents in the application of the principles of public health, and it should be national policy for this to become as basic a part of medical education as the skills of primary care. Medical schools need help to achieve this, and schools of public health must participate much more collaboratively than in the past. The standard practice of preventive medicine, health-hazard appraisal, perceiving the relationship of family and work to health, the analysis of one's own practice—these and many other sound epidemiological perspectives must be woven into the basic fabric of medical education.

Objective 2: *Restore the public health expert to the field of action.* One direct pathway to preventive action would be to put the experts in charge, or, more pragmatically, to give them a strong voice,—along with managers, professionals, and consumer representatives,—in our evolving national health service. A logical way to achieve this would be to reorganize and revitalize our often dormant state and local health departments and to merge them with state and regional planning agencies. Then the epidemiological perspective could be brought to bear, not only on the control and prevention of disease and injury, but on the organization and rationalization of population-based health services as well. Authority, responsibility, and accountability can make public health effective. As Professor J. N. Morris says, we must understand the *uses* of epidemiology.

Objective 3: *Bring the average citizen into the epidemiological equation.* I recommend two strategies. First, I have in mind a new participatory pattern of health education for the public to foster the voluntary adoption of better hygienic habits, motivated by rational self-interest. Recipients of health services so educated, incidentally, will make much more effective public representatives on the boards of health programs. Active consumer participation, with incentives for the promotion of health and the prevention of disease, must become basic principles of our national health-care program. The second strategy for bringing the average citizen into the picture is the point on which I wish to conclude for the sake of emphasis. I recommend a public policy of promoting population-based primary health services. By this I mean that all persons be registered with small groups of health-care providers. In larger clinics, primary care must be distinguished from specialty care, with primary-care clinics subdivided into teams who know the patients for whom they are responsible. The objective is simply for every individual to know who is looking after him or her and for every

primary-care physician and co-worker to be responsible for maintaining the health, as well as for treating the illness—not of patients, but of recognizable people. In such a relation, the providers will perceive directly what is “upon the people,” and will take a new professional pride in responding to the full range of health-related needs.

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